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User Manual

Climate Controller KR494

Version without Roof-top Heating

Issue: Februar 2003
Software V1.05

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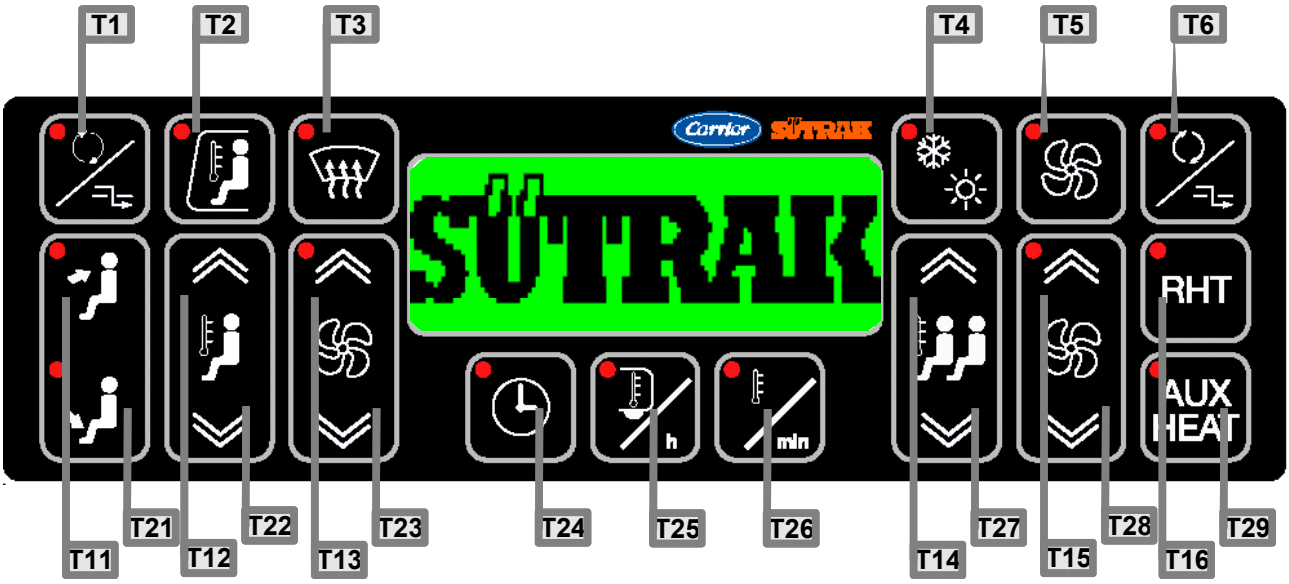
1 Key Functions



1.1 Standard functions

The function is active, if the corresponding key-LED is on.
Abbrevations: ZA = Ignition/Battery off, ZE = Ignition/Battery on, ME = Engine on

Function	Description	Requirement
T1: recirculated air front box	Change-over recirculated air/fresh air operation frontbox.	ZE, defrost function inactive (key function T3)
T2: temperature control front box	On/off-switching of temperature control frontbox. According to set-/actual-value of the temperature the water valve und the refrigerant valve of the frontbox are controlled. (refrigerant valve only with running air-conditioning of the passenger compartment)	ZE, defrost function inactive (key function T3)
T3: defrost function front box	On/off-switching of defrost function front box. The water valve opens completely, the blower runs with full power. The recirculated air flap changes to position of fresh air. By activating this function all other actual functions are stored and with deactivating restored again. (Keys T1, T2, T12, T22, T13, T23 are not in function during defrost operation)	ME
T11: distribution of upper air	no function with this version	
T21: distribution of lower air	no function with this version	
T12/T22: Temperature setting front box	By pressing T12 the set value of the frontbox temperature control increases in steps of 1K, by pressing T22 the set value decreases in steps of 1K. (range from 18°C to 28°C)	ZE, defrost function inactive (key T3), temperature control front box active (key T2)

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Function	Description	Requirement
T13/T23: blower setting front box	The blower speed of the front box increases (1 step) by pressing T13, resp. decreases by pressing T23. The max. step is 6 with function ME, otherwise 3. If Step 0 (blower off) is set, key-LED T13 turns off. During air-conditionining operation of the frontbox it is not possible to switch off the blower	ZE, defrost function inactive (key T3)
T24: Clock setting modes	no function with this version	
T25: Passenger compartment temperature display	Display temperature passenger compartment	ZE
T26: outside temperature display	Display outside temperature	ZE
T4: temperature control of passenger compartment	On/off switching of temperature control of passenger compartment. Convector valve, air-conditioning, air flaps and the blower speed are controlled in dependence of the set-/actual-value of the temperature	ZE
T5: Manual ventilation of passenger compartment	On/off switching of manual ventilation of passenger compartment.	ZE
T6: recirculated air of passenger compartment	The passenger compartment is set in return air operation. If this function is deactivated and temperature control is active, the flap position is set in dependance of of the temperature. If this function is deactivated and temperature control is not active, the flap is set in fresh air position.	ZE
T14/T27: Temperature setting of passenger compartment	By pressing T14 the set value of the frontbox temperature control increases in steps of 1K, by pressing T27 the set value decreases in steps of 1K. (range from 18°C to 28°C)	key function temperature control passenger compartment (T4) active
T15/T28:	The blower speed of the front box increases (1 step) by pressing T15, resp. decreases by pressing T28. The setting range with ME is step 1 – 6, with ZE step 1 - 3	key function manual ventilation passenger compartment (T5) active
T16: Reheat operation	no function with this version	
T29: Auxiliary heating	no function with this version	

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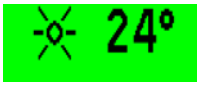
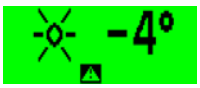
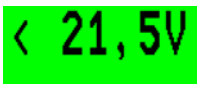
1.2 Special functions

Function	Description	Requirement
T14: Forced heating of passenger compartment	If the setpoint is set to 28°C, the passenger compartment is forced to heat by a renewed permanent pressing of this key about 2 seconds. The setpoint is indicated as an „:H:“, the convector valve completely opens.	ME
T27: Forced cooling of passenger compartment	If the setpoint is set to 18°C, the passenger compartment is forced to cool by a renewed permanent pressing of this key about 2 seconds. The setpoint is indicated as a „:C:“, the convector valve completely closes, air conditioning is switched on, the roof blowers are forced to run with maximum speed.	ME
T25 + T26 simultaneously: LCD-display contrast	By simultaneously pressing of these keys the LCD-display contrast increases to 1 step. After reaching the maximal contrast the display contrast is set to minimum.	ZE
T1 + T6 simultaneously: Test program	Simultaneously pressing of these keys: Start of test programs to check all electronical components and connected units.	-
T1 + T11 + T21 simultaneously: Renewed start (Reset)	Simultaneously pressing of these keys forces a „Reset“. (equivalence to conect/ disconect the power supply)	-

2 Display functions

Function	Description	Requirement
Displayed set point of the frontbox		Set point in °C
Displayed set point of passenger compartment		Set point in °C, resp. „:H:“ forced heating , „:C:“ forced cooling
Displayed blower speed of passenger compartment		Blower speed of passenger compartment step 1 ... 6
Displayed inside temperature		Inside temperature in °C
Displayed outdoor temperature		Outdoor temperature in °C, automaticallay displayed, if outdoor temperature is below 3°C.
Displayed state of air-conditioning		The air-conditioning symbol is displayed, if air-conditioning is on. „P<“ symbol is indicated, if under pressure is detected and „P>“ symbol is indicated, if over pressure is detected while air-conditioning is in operation.
Displayed state of frost warning		The frost warning symbol is displayed, if outdoor temperature is less than 3°C. After 10 seconds outdoor temperature is automatically displayed.
Displayed state of battery voltage		If the battery voltage is less than 21,5V for more than 30 seconds, it is indicated on the display. In this state all functions of the system are locked. If the battery voltage is higher than 25V for more than 30 seconds all functions are released again.

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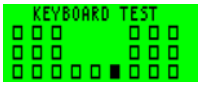
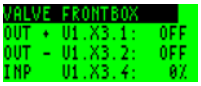
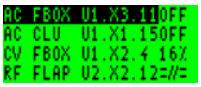
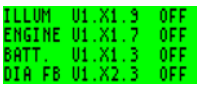
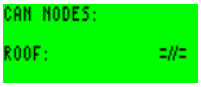
3 Test programs

Switching and state-displaying of all connected units are enabled any time by the test programs. If running these, there is no monitoring of the outputs. For that reason only qualified technicians may execute this!

Key	Display	Description
Start: T1 + T6 simultaneous Stop: T1		**Test menue:** The version of software is displayed (for example 105). The different test programs are selected by all „+“/“-“ keys. (T12, T22, T13, T23, T14, T27, T15, T28). The selected test program ist displayed inverted. (In this example: Test „LED“)
T26: Start T6: Stop		**LED- test:** All key-LEDs are switched on in succsession: T1, T2, T3, T4, T5, T6, T11, T13, T16, T21, T24, T25, T26, T29
T26: Start T6: Stop		**LCD- test:** The LCD display is filled from the left to the right side and erased subsequently.
T26: Start T21 + T29 simultaneous: Stop		**Key- test:** The keys are displayed by rectangles: a pressed key by a filled, an unpressed key by unfilled rectangle.(In this example: T26 is pressed). Attention: It is not possible to display more than one pressed key!
T26: Start T6: Stop		**Servo-motor- test**: With keys „+“/“-“ the different servo-motors are selected. The two outputs and the potentiometer input of the selected servo-motor are displayed. If there is no connection to the CAN-bus-node with the selected servo-motor, a flashing symbol „=/=“ is displayed. With keys T11 and T21 the direction of the motor is controlled. The display changes from „OFF“ to „ON“. There is a correct working of the servo, if you press key T11 and the display symbol changes from „OUT +“ to „ON“ just as the value of the potentiometer input decreases.
T26: Start T6: Stop		**Output- test:** With keys „+“/“-“ the different outputs are selected. The selected output is displayed inverted. The state of the output is displayed by „ON“ or „OFF“. If there is no connection to the CAN-bus-node with the selected output, a flashing symbol „=/=“ is displayed. With keys T11 and T21 the actually selected output is switched, without dependace of temperature control .
T26: Start T6: Stop		**Input-test:** With keys „+“/“-“ the different inputs are selected. The state of the input is displayed by „ON“ or „OFF“. If there is no connection to the CAN-bus-node with the selected input, a flashing symbol „=/=“ is displayed.
T26: Start T6: Stop		**Can-Bus test:** The version of software of the connected node is displayed. Nodes without connection are displayed by a flashing „=/=“.
T26: Start T6: Stop		**Blower test:** The state of blowers or groups of blowers is displayed. With keys „+“/“-“ the different blower(-groups) are selected. The actually selected group is diplayed inverted. With keys T11 and T21 the actually selected output is switched (slow/fast), without dependace of temperature control .

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4 Control and adjust functions

4.1 Initial switching on

After connecting the power supply and initial switching of ignition/battery the functions of frontbox- , passenger compartment- temperature control and frontbox blower are activated.

4.2 Functions ZA

With ignition off the display is deactivated too. There are only available the functions of test program and Reset.

4.3 Functions ZE

With ignition/battery on all functions are available, except frontbox and defrost. Temperature control of the passenger compartment only runs in convector heating mode. Roof blowers and air-conditioning are deactivated. A manual activating of the roof blowers is possible. The speed control of roof blowers and frontbox blower is limited by step 3.
With switching off battery/ ignition all active control-/adjust functions are stored. They are restored by a renewed battery/ ignition switching on.

4.4 Functions ME

With running engine all functions are available.
With switching off the engine the operation modes „forced heating“ and „forced cooling“ are reset to minimal resp. maximal setpoint. The operation modes of defrost function frontbox are stored wih switching off. They are restored by a renewed engine switching on.
The test programs are finished because of safety reasons. A renewed start of the test program is possible.

4.5 Under voltage

If the battery voltage is less than 21,5V for more than 30 seconds, it is displayed by a warning „< 21,5V“.
In this state all functions of the system are locked. If the battery voltage is higher than 25V (recharging of battery) for more than 30 seconds all functions are released again.

4.6 Calibration

The servo motors control works with a position-management. For that, the end points for the servos have to be measured to find the maximum movement. In order to measure this, both end positions of the valve have to be reached, and the corresponding parameters of the potentiometers must be internally saved. This procedure is called Calibrating. For a correct function of the calibrating and the following position-management it is necessary that the potentiometers of the servos motors are connected correctly, and the servos are moving in a proper way, without any brakes. Via the test mode “Servo” all motors can be checked. With selecting the output “OUT+“ the displayed potentiometer parameter must decrease, with “OUT-“ must increase.

Because its possible to interrupt calibrating when starting the test program “servo” the calibrating will be started from the beginning, after the test program is finalized.

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4.7 Control functions

Abbreviations: T_A = temp. outdoor, T_S = temp. setpoint, T_R = temp. inside , T_{FB} = temp. frontbox

Control states of passenger compartment:

State	Water valves	Roof blowers	recirculated-/Fresh-air flaps
Heating with ZE	Convector valve control with P-controller	off	recirculated air mode
Change-over to ventilation	not available with ZE		
Heating with ME	Convector valve control with P-controller	constant 25%	recirculated air mode
Change-over heating to ventilation	$T_A > T_S$-7,5K, simultaneous$T_R > T_S$ or if $T_A > T_S$-11K, simultaneous $T_R > T_S$+3K		
Ventilation	closed	constant 25%	Fresh air mode
Change-over ventilation after heating	$T_R < T_S$ – 0,3K		
Change-over ventilation after air-conditioning	$T_A > T_S$-10K, simultaneous $T_R > T_S$ + 0,7K or if $T_A > T_S$-14K, simul $T_R > T_S$+ 5K		
Air-conditioning	closed	25%...100% linear increasing between $T_R=T_S$ and $T_R=T_S$+4,5K	Fresh air mode
Air-conditioning off	$T_A < T_S$-16K or $T_R < T_S$		
Control off	closed	off	Fresh air mode

Control states of frontbox:

State	Water valve	Refrigerant agent valve
Heating	PID-Controller	off
Change-over to cooling	$T_{FB} > T_S$ + 1K	
Cooling	closed	on, if air-conditioning on
Refrigerant agent valve off	$T_{FB} <= T_S$	
Delay time after refrigerant agent valve off	$T_{FB} > T_{Ansaug}$ – 1,5K (In depedance of the air flap position outdor- or inside temperature is used) or 5 minutes after refrigerant agent valve switch off.	

The registration of frontbox temperature results from a sensor in the air outlet. The adjusted setpoint is copied to the real setpoint by characteristic curve. The results are the necessary temperatures for screen clearing.

Schedule of adjusted and depending real set points of the frontbox											
Adjusted:	18	19	20	21	22	23	24	25	26	27	28
Real:	16	17,6	19,3	21	26	31	36	41	46	51	56

4.8 Other control functions:

4.8.1 Control of „open door“ – signal

The rotation speed of the roof blowers is reduced to approx. 20% while doors are open.

5 Test program

With starting a test program the actual states of outputs are stored. Modifications by test programms („outputs“, „servo“ und „Blower“)are restored after finishing the test program by running control processes.